



# Digital Barometer Module

Water Services

User Manual Release 2

**Part Numbers:** Barom-RS485 & Barom-SDI12 model

Last updated Sept 2015

## Introduction

The digital barometer modules are low cost and power devices that have been designed to provide barometric values for data recording applications.

The barometers can be used in many different applications, and are ideally suited for use with PIEZO-RM range water level sensors. The sensors provide barometric pressure values directly in the same engineering units as to the water level sensors making analysis of results a simple operation.

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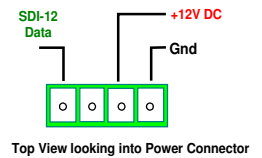
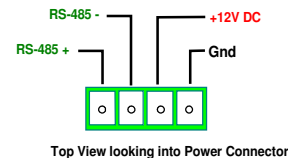
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Model Part No: Barom-RS485



Model Part No: Barom-SDI12



## What We Provide

### Warranty Provisions

Keynes Controls Ltd. warrants the Barom-SDI12 and Barom-RS485 model digital barometers for one year from date of purchase by the end user against defects in materials and workmanship under normal operating conditions.

To exercise this warranty contact Technical Support at the phone or e-mail address listed below for a return material authorization (RMA) and instructions. Complete warranty provisions are posted on our website at <http://www.aquabat.net>

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### HOW TO CONTACT US:

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Riseley Business Park  
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### Part Numbers used in this document

Part Number	Description	Further Details
Barom-SDI12	Digital barometer SDI-12 network	<a href="http://www.aquabat.net/Barometer/barometer-digital.html">http://www.aquabat.net/Barometer/barometer-digital.html</a>
Barom-485	Digital barometer RS485 network	Same as above
PIEZO-RM	Digital water level sensor	<a href="http://www.aquabat.net/PIEZOSummary/piezo-sensorsv1.html">http://www.aquabat.net/PIEZOSummary/piezo-sensorsv1.html</a>
SDI12-HB	Hand held SDI-12 USB media converter	<a href="http://www.aquabat.net/SDI12HBconv/sdi12hb-mediaconvert.html">http://www.aquabat.net/SDI12HBconv/sdi12hb-mediaconvert.html</a>
USBS12v1	USB-SDI12 digital network media converter	<a href="http://www.aquabat.net/USBSDI/usbs12mediav1.html">http://www.aquabat.net/USBSDI/usbs12mediav1.html</a>
USB-485v1	USB-RS485 digital network media converter	<a href="http://www.aquabat.net/USB485/USB-RS485mediav1.html">http://www.aquabat.net/USB485/USB-RS485mediav1.html</a>
Q-LOG	Data Recording and Display Software for SDI-12 and RS-485 intelligent sensors	<a href="http://www.aquabat.net/QLOGFree/qlogv2.html">http://www.aquabat.net/QLOGFree/qlogv2.html</a>

## Quick User Guide

The following guide describes the basic operations needed to make a test reading under user control from the barometer module. The easiest way to test and configure the 'Barom' range of sensors is by the Q-LOG application software.

It does not matter which model the procedure for testing the device and making configuration changes is the same when using the Q-LOG software.

Download and install the free Q-LOG application from

<http://www.aquabat.net/QLOGFree/qlogv2.html>

Default factory set SDI-12 / RS-485 ID number = 0

For Users familiar with programming an SDI-12 / RS-485 device using the industry standard commands then for a factor new sensor use: SDI-12 Command **'OM!'** - Start measurement and **'OD0!'** - Read Data Value  
RS-485 Command **'%OM!'** **'%OD0!'** where 0 = number zero.

Return: 0+1034.45+103400+21.00 or similar - the sensor should show the current barometric setting.

## Installation

1. Ensure the media converter is installed and identified by the PC. The media converter drivers will automatically be installed so long as an Internet connection is available on the PC. The driver software for the media converters is Microsoft Accredited.

The Comm port used by the media converter has to be Identified and noted before Q-LOG can be activated. Use the operating system control panel to select 'System Resources'. The Comm port is generally identified under 'Port' from within this menu.

2. Connect power to the Barometer using the USB-media converter. It does not matter which model of the sensor is to be used All the media converts are identified by their Comm Port number within Q-LOG and the type of network used is transparent to the User when using Q-LOG.

**The handheld USB media contains a sensor power supply.**

The power supply required for this sensor range is 12 V DC @ 10 mA.

3. Start Q-LOG software.

Select **'Q-LOG'** option from the main menu.

Select **'Configuration Option'** and a new Logging Configuration Window will appear.

Setup the desired sample rate, USB Comm Port number, and log file name.

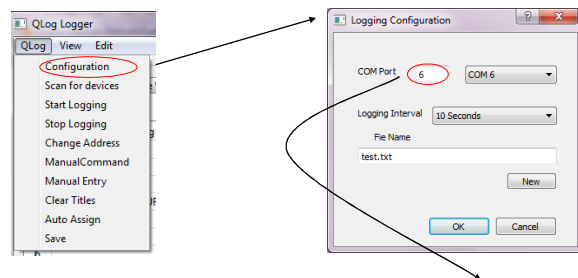
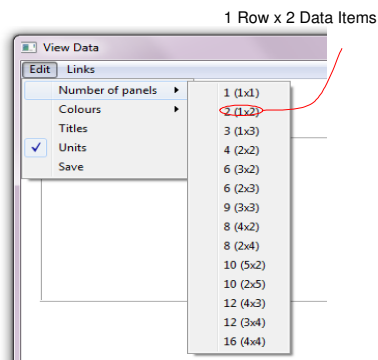
4. Select **'Scan for devices'** option. Q-LOG will scan the network for all supported sensors automatically and will identify the barometer.
5. Select **'View'** menu option from the main menu and select 'LCD' from the list that appears. A Window with panel meters will be displayed. Use the 'Number of panels' options to set 1 row x 2 items as highlighted below.

### Set the number of panel meter

For a single sensor set the panel meter display to show

1 row of 2 x data items.

Q-LOG will display 2 panels on to the screen and these will be configured to show temperature and pressure.



Note. Comm Port 6 is the port number for the USB-media converter.

Panel Meter Data Selection

Now that the barometer is installed and identified by Q-LOG then the temperature and pressure data has to identified and displayed. The Q-LOG menu system. The table of commands on page 8 shows that the sensor returns the parameters:

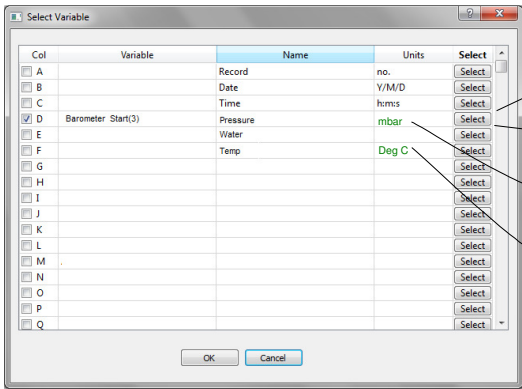
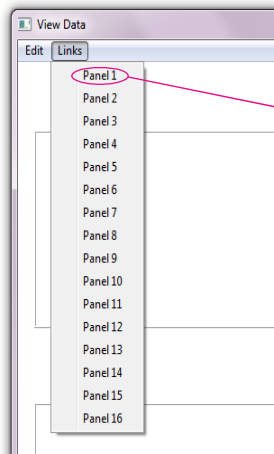
a + Press-mbar, mH20 @ 4°C +Temp (Deg C)      when it is instructed to send data.    Note a = ID number.

The most common parameter displayed is barometric pressure in mbar. This example will display pressure in mbar and temperature in Deg C and will only use a 1 row x 2 panel meter display. Factor default ID = 0

From the 'View Data' Window select 'Link' option - a list of Panel options appears. There are only 2 panels meters to be used.

Select 'Panel 1' menu option and the 'Variable Window' will appear.

'View Data' Window



Press the 'Select' button adjacent to the 'D' cell to make Q-LOG use this data item in the Panel\_1 display meter.

Type 'mbar' into this cell to display the correct pressure units on the panel meter display.

Type 'Deg C' into this cell to display the correct pressure units on the panel meter display.

The Variable Window will appear very similar to the one above. The units displayed by Q-LOG are set in this Window by simply typing them into the cell under the Units column. Full details for Unit selection can be found the User manual.

Once all the parameters are set into the 'Variable' Window select the 'OK' button to store the parameters and settings.

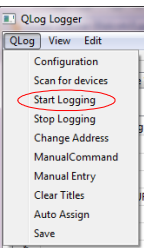
The pressure data value from the Barometer has now been selected.

Temperature Value Selection

Repeat the operation above but select the 'F' parameter from within the 'Set Variable' Window and assign it to Panel\_2 display.

Starting Data Display

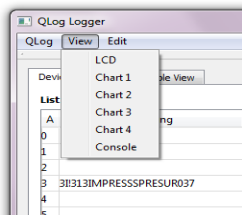
Select the 'Start Logging' option from the 'QLOG' menu list to start receiving data from the barometer. The small USB media converters use LED indicators to show that data is being transmitted across the network. These LED status indicators should now flash at the data logging rate.



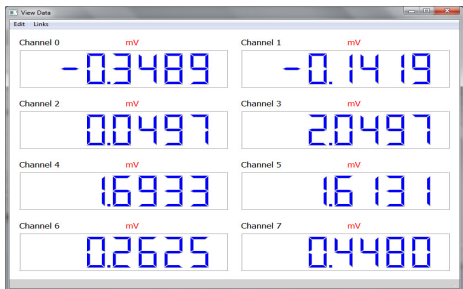
Viewing the Sensor Data

Select the 'LCD' option from the 'View' menu option.

The 'View Data' Window will appear and display the specified number of panel meters to the main display.



'View Data' Window



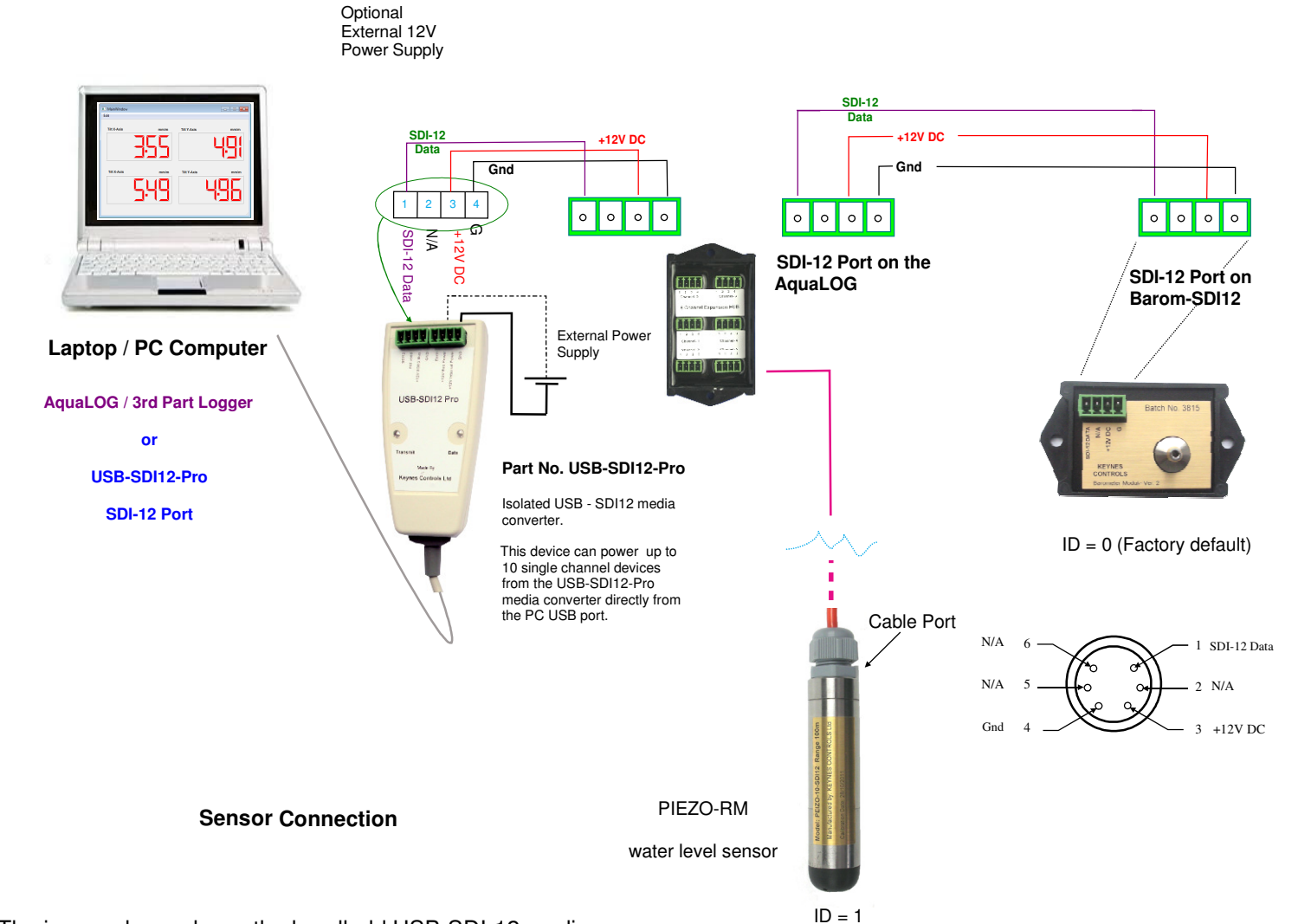
How to connect the Barometer to a PC using the SDI-12 network.

The following page shows how the **Barom-SDI12** sensor to a PC using the USB-SDI12 media converter and forms a very simple data acquisition system. The sensor converts the barometric readings into engineering units directly.

The Barom-SDI12 sensor is supported by the Q-LOG applications software which can be freely downloaded from the <http://www.aquabat.net> web site.

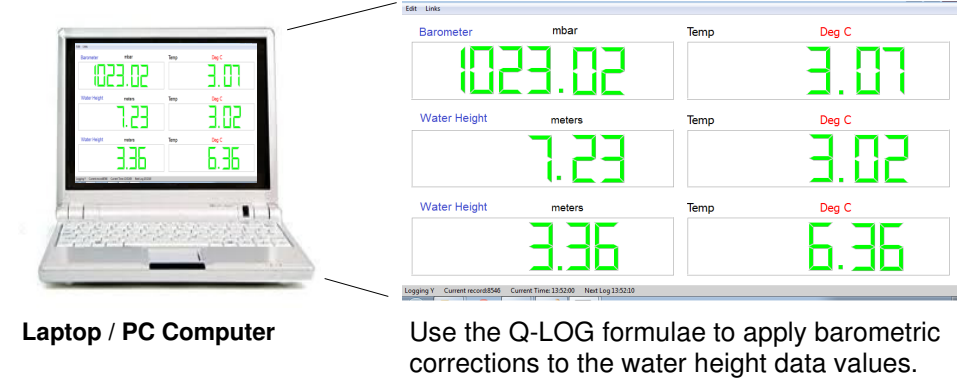
In order for the sensors to operate they require a unique network ID number. For the example below the Barom-SDI sensor has ID = 0, and the PIEZO-RM sensor will have ID = 1.

The Barom range of sensor supports ID numbers 0..9 and the extension a..z. The extended ID range is available on demand.



The image above shows the handheld USB-SDI-12 media converter with built in power supply unit.

This model can be supplied with a mains power supply for continuous data acquisition systems.



Q-LOG software

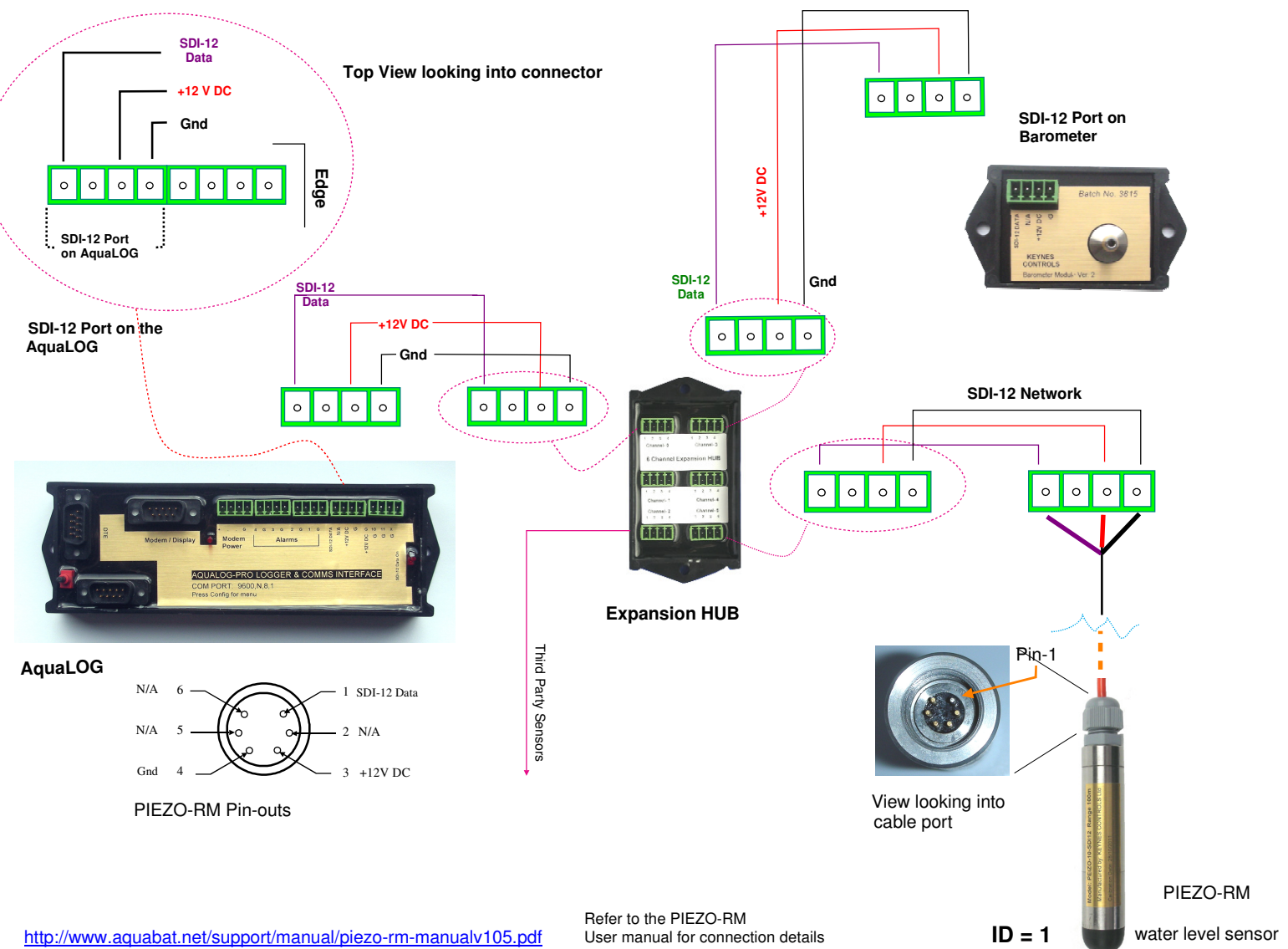
The Q-LOG software gives the User the ability to configure the supported sensors using a pull down menu system, and without any prior knowledge of any programming.

Use the Q-LOG software to set the sensors to the same engineering units. The Barom-SDI12 and PIEZO-RM can both be set to supply data values in units of metres (m).

## A Complete Water Level Recording Solution using the AquaLOG Data Logger

The drawing below shows how the SDI-12 digital barometer module is connected with a PIEZO-RM range liquid level sensor to create a complete water level recording system. The 6 port expansion hub has been shown in order to simplify the wiring installation.

The barometer and liquid level sensor have unique ID numbers in order that the logger can identify the results from the individual sensors. The PIEZO-RM level sensor and the barometer provide data values in the same engineering units. The logger can be configured to undertake the local barometric correction and/or store the individual data values.



### Setting the network ID number (Address)

In order to operate with a data logger or acquisition system the sensor ID number often has to be changed from the factory default ID = 0 to another free address.

### Changing ID address - SDI-12 Command

The Barom-SDI12 ID address can be changed under software control

For example. To change the Barom-SDI12 address from ID = 0 to ID = 5 issue the command:

$xAy!$  Where x = start ID number y = New SDI-12 ID number - *Standard SDI-12 command*

Example:  $0A5!$  — the ID address of the barometer module initially set to ID = 0 is changed to ID = 5.

### Changing ID address - RS485 Command - '%' Prefix

For example. To change the Barom-485 address from ID = 0 to ID = 5 issue the command:

$\%xAy!$  Where x = start ID number y = New SDI-12 ID number - *Standard RS-485 command*

Example:  $\%0A7!$  — the ID address of the barometer module initially set to ID = 0 is changed to ID = 7.

Measurement Operations with AquaLOG Data Logger

The following section details the integration and measurement operations of the Barom-SDI12 barometer with the AquaLOG data logger.

The Barom-SDI12 will operate with any 3rd party SDI-12 based data logger however the simplest way of making and storing measurements is with the AquaLOG data logger unit.

- 1. Connect the Barom-SDI12 to the AquaLOG as shown at the top of page 4.

For full instructions in the use of the AquaLOG see the product User Manual.

The AquaLOG is configured using a menu system in exactly the same way as described for the Barom-SDI12 and uses a terminal program to display the in-built menu system. Details for the serial port connection and port settings are shown in page 2.

Upon connection of power and the terminal connection the following menu will be displayed:

**Main Menu**

- 1 Device Setup
- 2 Zigbee Mode Settings
- 3 GPRS Mode Settings
- 4 USB Memory Stick Settings
- 5 SDI12 Setup
- 6 Formulas
- 7 Alarms
- 8 Logging Operations
- 9 Diagnostics
- A System Maintenance
- U Up. T Top.

The Barom-SDI12 sensor can be configured using the **‘Transparent’** mode feature of the AquaLOG menu system.

See the AquaLOG User manual page 10 for further details.

Configuring the AquaLOG to make a barometric measurement

Selection option ‘5 - SDI-12 Setup’ from the AquaLOG Main Menu

The following menu similar to that below will appear:

**SDI12 Setup**

- 1 Powerup delay (ms) 500
- 2 Powerdown delay (ms) 0
- 3 Device 1 Command **[D] 1M! 1D0!**
- 4 Device 2 Command
- 5 Device 3 Command
- 6 Device 4 Command
- 7 Device 5 Command
- 8 Device 6 Command
- 9 Device 7 Command
- A Device 8 Command
- B Device 9 Command
- C Device 10 Command
- U Up. T Top.

Enter Device 1 Command

**Terminal Port Setting**

Default settings for the AquaLOG terminal port are:

- 9600 Baud
- 8 Data bits
- 1 stop bit
- No parity

**Note.**

In this example the Barom-SDI12 has **ID = 1** and the results will be written into the data table starting at cell ‘D’

**Example**

If the Barom-SDI12 has 3 x SDI-12 parameters configured for output then the results for this example will be written into cells

**D E F**

Within the AquaLOG data table.

Sample rate

The sample rate for the Barom-SDI12 data is set within the AquaLOG as the rate in which measurements are made.

From the AquaLOG main menu select option ‘8’ **Logging Operations** and the following menu will appear

Select option ‘1’ to assign the sample rate

At the command prompt enter the new sample

**Enter Sample Rate Period (seconds)** 60 (1 reading / min)

For 1 min sample rate = 60  
1 hour sample rate = 3600

To start readings at the new rate press the ‘Menu Activation Button’ on the AquaLog.

**Logging Operations**

- 1 Sample Rate Period (seconds) 30
- 2 Logger Info
- 3 Download Data
- 4 Reset Logger
- U Up. T Top.

**Enter Sample Rate Period (seconds)**



Barom Sensor Maintenance Operations

Both of the Barom-SDI12 and Barom-RS485 sensors are supplied in an encapsulated immersion proof / dust proof enclosure as standard. The sensors will operate even after a short duration immersion in water.

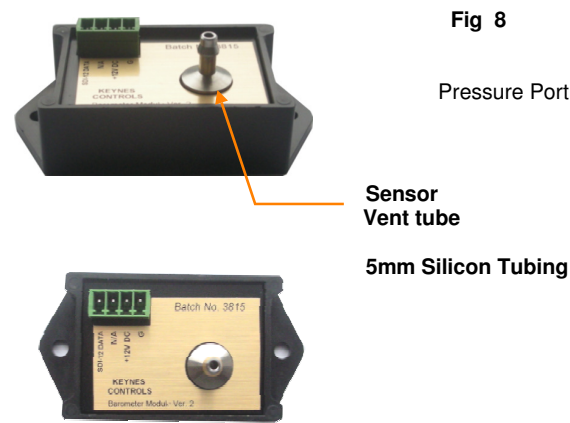


Fig 8

For optimum performance

After any immersion in water be that accidental under testing of if the instrument becomes flooded as part of its routine operation.

1. Check that no dirt has collected or blocked the sensor vent tube. Any blockage in the vent tube can corrupt the results.  
  
Clean out the vent tube using clear tap water.
2. Remove the power supply cable and check to see that there is no build of any dirt on the connectors. Remove and unwanted material and re-connect the supply.

Installation

1. Drill 2 x 4 mm holes in-line but spaced 89 mm apart into the panel or wall to be used to mount the Barometer.

In the case of enclosures supplied with a Barom version sensor, then locate the barometer module onto the panel and secure with the plastic caps that will have been included with the product. The caps offer fast installation and removal for servicing operations.

2. Ensure that the Barometer vent tube port is clear of any obstruction. A blockage in the vent port can cause errors the barometric measurement.
3. When fitting the barometer make sure atmospheric vent into the enclosure being used. The sensor wont respond accurately should the sensor cabinet have been made air tight.

The simplest solution for using the barometer is to drill 2 x small vent holes into the bottom of the enclosure. Any condensation will also be vented away from the electronics. For long term deployment rain filters should be fitted over any vent holes.

Vent Tubing

4. For applications where is is not feasible to mount the sensor away from the logger unit due to space, wiring, power restrictions then a vent tube can be connected onto the pressure port nipple. The vent tube outlet can be mounted at a more convenient location and the barometric air supply piped to the pressure port.

It is a good idea to fit a filter over the vent tube outlet to the atmosphere to prevent the ingress of water to the sensor element.

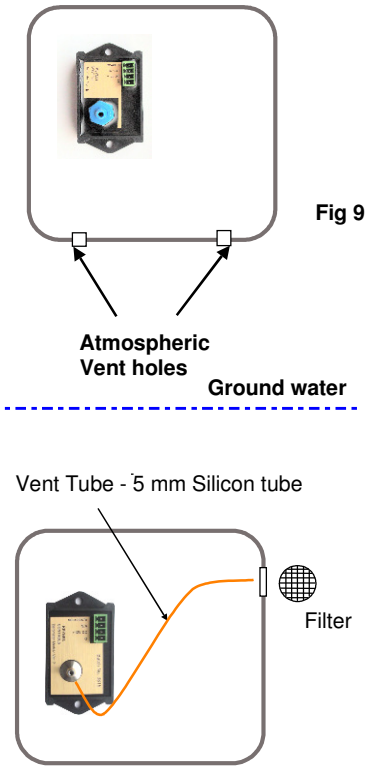
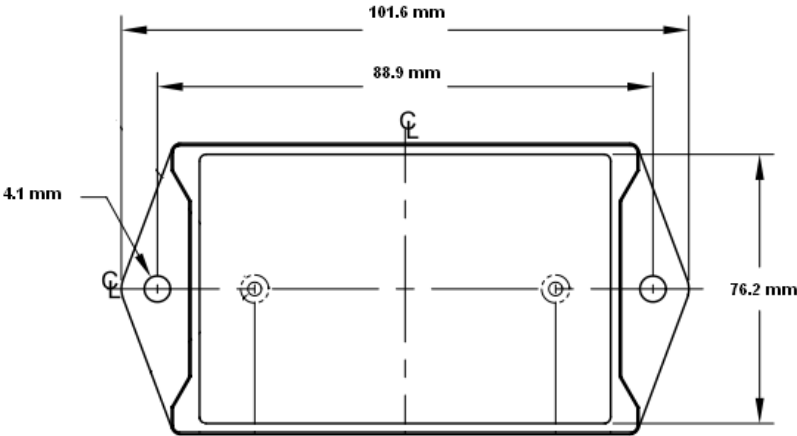


Fig 9

Physical Dimensions



Technical Specifications

The following table details the technical specifications for the barometer sensors.

		Maximum error of pressure reading over the pressure range.			
Barometric Pressure		Min	Typical	Max	Units
Resolution			0.1		mbar
Range	750 - 1100				mbar
Absolute Pressure Accuracy	p =750 .. 1100 mbar at 25 °C	-1.5		1.5	mbar
Pressure Long term stability	12 months		1		mbar
Temperature			0.1 Deg software limited		
Resolution					Deg C
Accuracy	20 °C	-0.8		0.8	Deg C
	-40 to 85	-2		2	Deg C
Operating Range	-40 to 85				Deg C
Power Supply		10	12	18	Volts
Idle mode			SDI-12 = 0.5 RS-485 = 1.1		mA
Active / measurement			SDI-12 = 2.1 RS-485 = 2.6		mA
Physical Dimensions	L = 50.80 W = 38.10 H = 19.05		All models		mm
Vent Tube diameter	4 mm		All models		

Table of Commands

The following commands are used to take readings from the barometer sensors.

SDI-12 Command	Description
aM!	Start measurement
aD0!	Obtain data a + Press-mbar, mH2O @ 4°C +Temp (Deg C)
RS-485 Command	
%aM!	Start measurement
%aD0!	Obtain data a + Press-mbar, mH2O @ 4°C +Temp (Deg C)

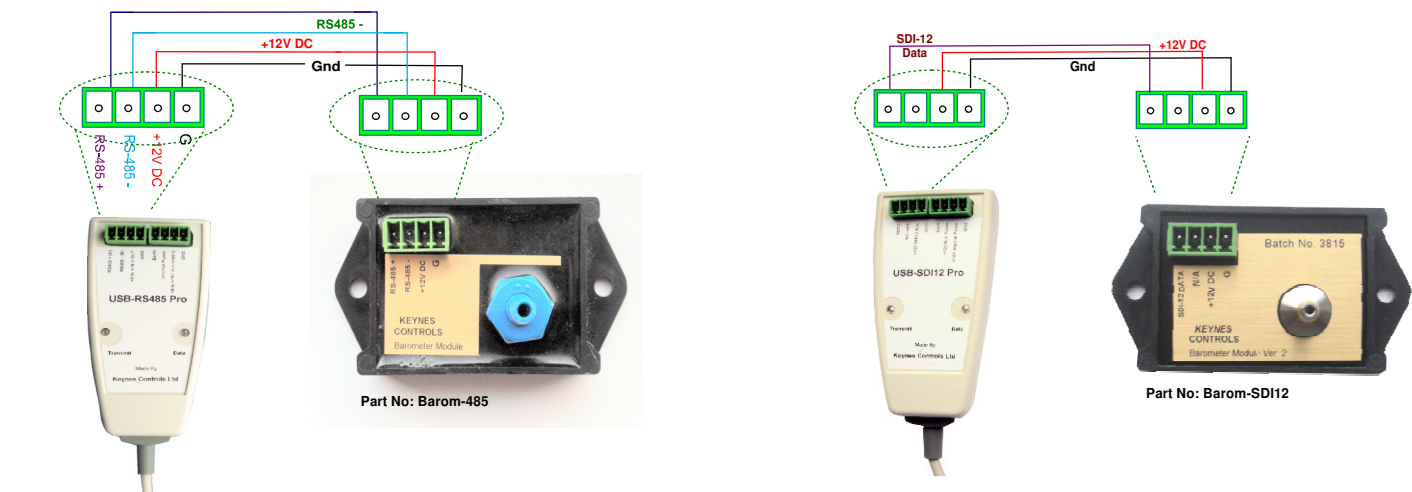
The Barom-SDI12 and Barom-485 models can be configured to supply data values in different engineering units.

SDI-12 Command	RS-485 Command
aXR!	%aXR!
Results string list - Default "A C E"	
A = mbar B = mH2O C = Pascal D = mbar E = Temperature	
aXI n!	%aXI n!
where n = integration period in milli-seconds 1000 mS = 1 second	

**Example.** Using the Barom-SDI12 sensor change the ID number form 0 (factory default) to 7 and use an integration period for ½ second.

**0A7!** – change ID = 7 further detail on page 5      **7XI 500!** - integration period for sample measurement = 500 mS.

Barometer Connection to USB-SDI12-Pro and USB-485-Pro media converters





Connecting the Barom-SDI12 to a RS-485 network.

The drawing below shows how the RS-485 version digital barometer module is connected onto the digital network.

The barometer module is shown in use with a PIEZO-RM range intelligent sensor and a PC and this used to create a complete water level recording and display system. The barometer and PIEZO-RM sensors are both fully encapsulated devices and transmit data digitally across the network for data storage and presentation. Any local barometric correction of the water height data values is undertaken in the data recorder or PC.

.A USB-RS485 media converter and the Q-LOG applications software can be used to record and plot data values onto the PC.

